253248
RECORD NO.

129016
SHAUGHNESSEY NO.

REVIEW NO.

EEB REVIEW MAR 15 1990

DATE: IN 12/07/89 OUT

FILE OR REG. NO.

PETITION OR EXP. NO. 464-EUP-RNG

DATE OF SUBMISSION 09/28/89

DATE RECEIVED BY EFED 11/28/89

RD REQUESTED COMPLETION DATE 02/28/90

EEB ESTIMATED COMPLETION DATE 02/28/90

RD ACTION CODE/TYPE OF REVIEW 700

TYPE PRODUCT(S) Herbicide

DATA ACCESSION NOS. 412632-18 thru 28

PRODUCT MANAGER NO. J. Miller (23) /R. Ikeda

PRODUCT NAME(S) XRD-498 (XRM-5019, Dowco 498)

COMPANY NAME Dow Chemical Co.

SUBMISSION PURPOSE Determine if studies are adequate prior to EUP issuance

SHAUGHNESSEY NO.	CHEMICAL AND FORMULATION	% AI

EEB REVIEW

Chemical: XRM-5019 (XRD-498)

100 Submission Purpose and Label Information

100.1 Submission Purpose and Pesticide Use

This is a first-time EUP request for the use of XRM-5019 herbicide on 39 acres of corn and soybeans in 15 states (AR, GA, IL, IN, IA, MI, MN, MS, MO, NB, NC, OH, SB, TN, WI). XRD-5019 is a sulfonylurea herbicide.

100.2 Formulation Information

ACTIVE INGREDIENTS:	
N-(2,6-difluorophenyl)-5-methyl(1,2,4)triazole 1,5-a-primidine-2-sulfonamide (XRD-498).....	74.9%
INERT INGREDIENTS:.....	25.1%
TOTAL:	100.00%

This product appears to be a wettable powder or dry flowable. No distinction was given in materials submitted.

100.3 Application Methods, Directions, and Rates

Application is by ground equipment only; 20 to 30 gallons water per acre; 20 to 40# pressure/sq. inch; with flat fan nozzles. XRM-5019 will be applied pre-plant incorporated, preemergence to the soil surface with no incorporation, and as a postemergence foliar spray to corn and soybeans. PPI rates are 0.04 to 0.17# product per acre (0.03 to 0.13# ai/A) incorporated in the top 2 to 3 inches of soil within 2 weeks of planting. Pre-emergence surface application is applied before planting at the same rates as PPI. The postemergence foliar treatment is applied after the weeds are in the 2 to 4 true leaf stage. Postemergence rates are 0.02 to 0.08# product per acre (0.015 to 0.062# ai/A). The proposed label does not specify multiple treatments, however, Section G (page 41) does indicate PPI, Pre, and/or postemergence applications will be evaluated. The proposed label states that all treated corn and soybean crops will be destroyed or used for research purposes only.

100.4 Target Organisms

Annual broadleaf weeds.

100.5 Precautionary Labeling

No environmental precautions are given.

100.6 Proposed EUP Program

100.6.1 Objectives

To assess the product performance of XRM-5019 for broadleaf weed control in corn and soybean production systems.

100.6.2 Date and Duration

March 1,1990 to March 1,1991.

100.6.3 Amount Shipped/ Geographical Distribution

Approximately 6.73# of XRM-5019 (5.05# active ingredient) will be used in corn and soybean producing states. See 100 above.

101 Hazard Assessment

101.1 Discussion

If one pre-plant incorporated or pre-emergence surface application plus one postemergence treatment were applied per acre, the total active ingredient would be:

	0.130#ai/A	- Max. PPI or Pre rate
+	0.062#ai/A	- Max. Post. rate
TOTAL:	0.192#ai/A/season	

101.2 Likelihood of Adverse Effects on Nontarget Organisms

AVIAN

Species	Test type*	Results
Bobwhite quail	Dietary LC50	>5620 ppm **
Mallard duck	Dietary LC50	>5620 ppm **
Bobwhite quail	Acute oral LD50	>2250 mg ai/Kg**

FISH

Species	Test type*	Results
Atl. silversides	96 hr. LC50	>380 mg/L**
Flathead minnow	96 hr. LC50	>300 mg/L**
Bluegill	96 hr. LC50	>300 mg/L**
Rainbow trout	96 hr. LC50	>300 mg/L**

* All tests were with 99.6% technical XRD-498.
** Classified as "Practically non-toxic".

AQUATIC/ESTUARINE INVERTEBRATES

Species	Test type*	Results
Daphnia magna	48 hr. LC50	243 mg/L**
Grass shrimp	96 hr. LC50	>350 mg/L**
Eastern oyster	96 hr. EC50	>100 mg/L**

INSECT

Species	Test type*	Results
Honey-bee	Acute Contact LD50	>100 ug/bee*** NOEL:36 ug/bee

* All tests were with 99.6% technical XRD-498.
** Classified as "Practically non-toxic".
*** Classified as "Relatively non-toxic".

MAMMALS

Species	Test type	Results
Rat	Acute oral*	>5000 mg/Kg (M+F)
Rat	Sub-chronic (13wk) oral	1000 mg/Kg/day (F) 250 mg/Kg/day (M)
Rat	Teratology	1000 mg/Kg/day (NOEL)
Rat	Mutagenicity	Ames - Neg. DNA Assay - Neg. Mutation Assay - Neg. Bone Marrow - Neg.
Rat	Acute oral**	>5000 mg/Kg (M+F)

* Technical form - 99.6% active ingredient.
** Formulation, 74.9% active ingredient.

PLANTS

No studies are available.

ENVIRONMENTAL FATE INFORMATION

The vapor pressure of XRD-498 is 0.8 x ten to minus 15 mmHg at 20 degrees C. (very low). The water solubility is 49 ppm (pH 2.5, 25 degrees C) and 5,650 ppm (pH 7.0, 25 degrees C). The octanol/water, Kow= 1.62. XRD-498 is stable to hydrolysis at pH 5,7,9 at 25 degrees C in the dark with no loss of parent compound after 66 days of incubation. The soil half-life varies from 23 days at low pH to 4 months at high pH. The high pH half-life is reduced to 2 to 4 weeks if the organic carbon content of the soil is under 2.5%. XRD-498 persistence in the field should be shorter for soils with higher pH, but longer for soils with higher organic carbon content. XRD-498 is more water soluble at higher pH but of shorter persistence; unless the soil contains greater than 2.5% organic carbon.

TERRESTRIAL EXPOSURE

The proposed maximum rate for postemergence application to foliage is 0.062# ai/Acre. From the Kenaga chart of maximum expected terrestrial pesticide residues on vegetation, the use of XRD-5019 is not expected to acutely affect non-endangered avian or mammalian species.

short rangegrass	<20 ppm
tall rangegrass	<10 ppm
leaves and leafy crops	<10 ppm
forage, alfalfa, clover	<06 ppm
pod containing legumes	<06 ppm
fruit, cherries/peaches	<00.8 ppm

AQUATIC EXPOSURE

Due to high water solubility at high pH levels, a 5% runoff expectation is used in the calculations. If 10 treated acres drain into a 1 acre pond, the following aquatic exposure levels are calculated:

0.130# ai/A (1 Pre soil surface)
x 10 acres

1.300# ai applied
x 0.05 5% runoff

0.065# ai into a pond

EEC
6 foot deep pond = 4 ppb
6 inch deep pond = 48 ppb

If an additional application of 0.062# ai/A were applied postemergence, the total per acre amount of 0.192# ai/A would result in the following EEC's:

EEC
6 foot deep pond = 6 ppb
6 inch deep pond = 71 ppb

These expected exposure levels are well below the acute LC50 levels for fish, Daphnia magna and grass shrimp; and well below the EC50 level for Eastern oyster:

ONE-TENTH THE LC/EC50 VALUES	
Atlantic silversides	38 ppm
Flathead minnow	30 ppm
Bluegill	30 ppm
Rainbow trout	30 ppm
Daphnia magna	24 ppm
Grass shrimp	35 ppm
Eastern oyster	10 ppm

Based on these values, this EUP is not expected to cause acute adverse effects to non-endangered aquatic or estuarine species.

Based on honey-bee acute toxicity data, this EUP is not expected to adversely affect non-endangered beneficial insect species.

101.3 Endangered Species Considerations

TERRESTRIAL

This EUP use of XRM-5019 is not expected to be acutely toxic to mammalian or avian endangered species.

ONE-TENTH THE LC/LC50 VALUES	
avian species tested	562 ppm (dietary)
	225 ppm (acute oral)
rat	500 ppm (acute oral)

AQUATIC

This EUP use is not expected to be acutely toxic to endangered aquatic or estuarine species.

ONE-TWENTIETH THE LC/EC50 VALUES	
Atlantic silversides	19 ppm
Flathead minnow	15 ppm
Bluegill	15 ppm
Rainbow trout	15 ppm
Daphnia magna	12 ppm
Grass shrimp	18 ppm
Eastern oyster	05 ppm

INSECT

Based on the honey-bee acute study, this EUP is not expected to be acutely toxic to endangered insect species. This herbicide will primarily be applied in the spring before most crops have emerged.

PLANTS

No non-target plant studies are available for review. Because XRM-5019 will be applied exclusively by ground equipment, and because so few acres will be treated, we expect minimal off-target movement to endangered plant species during application.

101.4 Adequacy Of Toxicity Data

The data submitted were found adequate for an assessment of the acute toxicity of XRM-5019 to terrestrial and aquatic animal species.

101.5 Adequacy of Labeling

The proposed EUP label appears adequate.

102.0 Classification

Not currently classified.

103 Conclusions

The EEB has completed a review of the proposed EUP plus 11 basic acute studies submitted with the proposal (DER's attached). Based on the available information, XRM-5019 is not expected to adversely affect endangered or non-endangered off-target plants and animals. Based on the proposed use patterns and rates, adverse chronic effects are not expected. Chronic toxicity tests will be reserved pending the availability of a more complete environmental fate data base (ie. half-life in water, soils), and the Section 3 use sites and rates.

Prior to Section 3 registration the registrant must provide the following:

1.) 123-2 Tier II Aquatic Plant Growth for Selenastrum capricornutum (water solubility >10 ppm).

If aerial application is proposed at a later date, the agency must receive the following studies in addition to the above listed study:

1.) 123-1 Tier II Seed Germination/Seedling Emergence

2.) 123-1 Tier II Vegetative Vigor

3.) 123-2 Tier II Aquatic Plant Growth for
Lemna gibba (duckweed)
Skeletonema costatum (marine diatom)
Anabaena flos-aquae (blue-green alga)
Unspecified species (freshwater diatom),

4.) Drift, 201-1,

5.) Drift, 201-2.

Richard C Petrie 3/13/90

Richard C. Petrie, Agronomist
Ecological Effects Branch
Environmental Fate And Effects Division (H7507-C)

Ann Stavola 3/13/90

Ann Stavola, Acting Head, Section III
Ecological Effects Branch
Environmental Fate And Effects Division (H7507-C)

James W Akerman 3/13/90

James W. Akerman, Chief
Ecological Effects Branch
Environmental Fate And Effects Division (H7507-C)

File - 129016

Use this form for individual studies & to submit pesticide applications.

United States Environmental Protection Agency
Office of Pesticide Programs
Washington, DC 20460

Data Review Record

Confidential Business Information - Does not contain National Security Information (E.O. 12065)

New Chemical

Pack Number	Date Received
49859 EFED	11-28-89

1. Product Name: XRM Herbicide

Chemical Name: XRD-498

2. Identifying Number	3. Record Number	4. Action Code	5. MRID/ Accession Number	6. Study Guideline or Narrative			
464-EUP-RNG	153,248	700	412632-21	72-1		412632-18	71-1
			412632-22	72-1		412632-19	71-2
			412632-23	72-1		412632-20	71-2
			412632-24	72-2			
			412632-25	72-3			
			412632-26	72-3			
			412632-27	72-3			
			412632-28	141-1			

7. Reference No.	8. Date Rec'd (EPA)	9. Prod/Review Mgr/DCI	10. PM/RM Team No.	11. Date to HED/ EFED/RD/BEAD	12. Proj Return Date	13. Date Returned to RD/SRRD
1	9/28/89	Miller/R.Ikeda	23	11/28/89	2/28/90	

Instructions

Please review the above studies and indicate what additional studies are required prior to issuance of the permit.

This Section Applies to Review of Studies Only

14. Check Applicable Box

- ☐ Adverse 6(a)(2) Data (405)
- ☐ Special Review Data (870)
- ☐ Generic Data (Reregistration) (660
- ☐ Product Specific Data (Reregistration (655)

15. No. of Individual Studies Submitted: 11

16. Have any of the above studies *(in whole or in part)* been previously submitted for review?

- ☐ Yes *(Please identify the study(ies))*
- ☒ No

17. Related Actions: —

18.	To	Type of Review	19. Reviews Also Sent to		20. Data Review Criteria
HED		Science Analysis & Coordination	☐ SAC	☐ PC	A. Policy Note No. 31
		Toxicology/HFA	☒ TOX/HFA	☐ PL	
		Toxicology/IR	☐ TOX/IR		☐ 1 = data which meet 6(a)(2) or meet 3(c)(2)(B) flagging criteria
		Dietary Exposure	☐ DEB	☐ EA	
		Nondietary Exposure	☒ NDE	☐ AC	
EFED	☒	Ecological Effects		☐ BA	☐ 2 = data of particular concern from registration standard
		Environmental Fate & Groundwater	☒ EEB		
SRRD		Special Review	☒ EFGWB		☐ 3 = data necessary to determine tiered testing requirements
		Reregistration			
		Generic Chemical Support	☐ SR		
RD		Insecticide-Rodenticide	☐ RER		B. Section 18
		Fungicide-Herbicide	☐ GSC		☐ 1 = data in support of section 3 in lieu of section 18
		Antimicrobial			
		Product Chemistry	☐ IR		C. Inert Ingredients
		Precautionary Labeling	☐ FH		☐ 1 = data in support of continued use of List 1 inert
BEAD		Economic Analysis	☐ AM		
		Analytical Chemistry			
		Biological Analysis			

☒ Confidential Statement of Formula (EPA Form 8570-4) Attached *(Trade Secrets)*

☒ Label Attached

RIN 1948-94

FLUMETSULAM REVIEWS (129016)

Page_____ is not included in this copy.

Pages 10 through 15 are not included.

The material not included contains the following type of information:

____ Identity of product inert ingredients.

____ Identity of product impurities.

____ Description of the product manufacturing process.

____ Description of quality control procedures.

____ Identity of the source of product ingredients.

____ Sales or other commercial/financial information.

__✓__ A draft product label.

____ The product confidential statement of formula.

____ Information about a pending registration action.

____ FIFRA registration data.

____ The document is a duplicate of page(s) _____.

____ The document is not responsive to the request.

The information not included is generally considered confidential by product registrants. If you have any questions, please contact the individual who prepared the response to your request.

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(2) **Name the states in which the pesticide will be used, along with the amount to be used and the acreage to be treated in each state. Where "acreage" does not apply, give extent of testing per state in more appropriate terminology. Indicate separately any other state(s) to which the pesticide may be shipped for further distribution.**

The following table provides information relative to treatment sites:

State	Maximum acreage of soybeans and field corn to be treated 1990	Maximum amount (lbs) of XRM-5019 formulation to be used 1990
Arkansas	2	0.33
Georgia	1	0.16
Illinois	4	0.66
Indiana	4	0.66
Iowa	4	0.66
Michigan	3	0.49
Minnesota	3	0.49
Mississippi	3	0.49
Missouri	2	0.33
Nebraska	2	0.33
North Carolina	2	0.33
Ohio	3	0.49
South Dakota	3	0.49
Tennessee	3	0.49
Wisconsin	2	0.33
TOTAL	39	6.73

(3) **Give the details of the proposed program, including the types of target pests or organisms, the crops, animals, surfaces, materials, buildings, or sites of application to be treated, and the major geographical areas where the material is to be used. For seasonal pests and crops, indicate the desired month for pesticide application to begin. Specify the use pattern, intended plot sizes, number of plots, number of replicates, dosage rates, methods of application (preplant, postemergence, multiple [indicate pattern and number], etc.)**

XRM-5019 herbicide is to be evaluated for preplant incorporation, preemergence and/or postemergence application to soybeans or field corn for control of broadleaf weeds. Dowco 498, the active ingredient in XRM-5019 has shown a high level of activity on many broadleaf weeds that are common problems in soybeans and field corn (see proposed product label) with minimal activity on the crop. Suggested use rates for evaluation as a preplant incorporation or preemergence herbicide are 0.04 to 0.17 lb. of XRM-5019 per acre (0.3 to 0.13 lb. of XRD 498 per acre). Suggested use rates for evaluation as a postemergence herbicide are 0.02 to 0.08 lb. of XRM-5019 per acre (0.015 to 0.062 lb. of XRD-498 per acre) in field corn and 0.01 to 0.02 lb. of XRM-5019 in soybeans. Control of grasses in the test site will be achieved by evaluating XRM-5019 as a tank-mix with standard preplant incorporation or preemergence herbicides or as a sequential treatment with standard postemergence herbicides. Experimental use of XRM-5019 will involve replicated trials evaluating the formulation alone and in conjunction with standard grass-control herbicides. All treatments will be applied using ground equipment. The maximum size of any test location will be two acres. All applications will be made by Dow Chemical Company personnel.

(4) **List the objectives of the proposed program, i.e., what type(s) of data will be collected during the testing period (performance, yield, phytotoxicity, environmental residue, etc.). Indicate your long-range testing plans, including how many years you expect to conduct experimental testing in support of registration of this use. This information will be helpful in evaluating the currently proposed program.**

The primary objective of this program is to evaluate the effectiveness of XRM-5019 for broadleaf weed control under a broad range of environmental (weather and soil) conditions. Variables within the experimental designs will include spray volume, rates of XRM-5019, timing of application and use in conjunction with standard grass control herbicides. Although all of the following types of data may not be obtained at each test location, data to be gathered include weed control by species at 2, 4, and 6 weeks after application, crop vigor and yield (optional). Additional experimental details, such as date of crop planting, date(s) of application(s), stage of crop at time of application, soil analysis, rainfall, etc., will also be recorded. It is the intent of the applicant to conduct further experiments during the 1991 and 1992 growing seasons and to obtain conditional registration of the product by January 1, 1993.

(5) Submit an explanation to justify the quantity of material requested, including the various parameters used to determine the quantity. Quantities authorized will be based on the program submitted and consideration of the types and amount of data required to support registration.

The 15 states encompassed by the proposed experimental program represent most of the major soybean and field corn producing states. These states also represent a broad range of growing condition,s cultural practices, soil types and weed problems. To effectively determine the performance of XRM-5019 herbicide requires testing under the wide range of conditions represented by these 15 states. A rate of 0.166 pounds per acre of XRM-5019 was used in calculating the quantity of material requested.

(6) Propose a suitable duration for the permit commensurate with the program. Any request for a period greater than one year must be adequately justified.

It is proposed that the permit run from March 1, 1990, to March 1, 1991. This period is needed to adequately evaluate XRM-5019 under a wider range of environmental conditions (rainfall and temperatures).

(7) State the method of disposition of any unused material left at the conclusion of the testing program.

Upon completion of tests, empty containers will be disposed of in accordance with local, state, or Federal regulations. Unused XRM-5019 will be returned to Ms. C. Varner, Agricultural Products Department, 9001 Building, Corner E. Ashman and Rockwell Road, The Dow Chemical Company, Midland, Michigan, 48641.

WILDLIFE AND AQUATIC ORGANISMS

TOXICOLOGICAL STUDIES - SUMMARY

Avian

- Acute Oral LD50
  - Mallard - >2250 mg/kg
- Dietary LC50
  - Bobwhite - >5620 ppm
  - Mallard - >5620 ppm

Invertebrate Testing

- Acute Contact LD50
  - Honey bee - NOEL = 36 ug/bee

Aquatic Organism Testing

- LC50 (96 hr. exposure)
  - Rainbow trout = >300 mg/L
  - Bluegill = >300 mg/L
  - Fathead minnow = >300 mg/L
  - Silversides = >379 mg/L
  - Grass shrimp = >349 mg/L
- LC50 (48 hr. exposure)
  - Daphnia magna = 174 mg/L
- EC 50 (96 hr. exposure) (Shell growth)
  - Eastern oyster = >173 mg/L

DOWCO 498

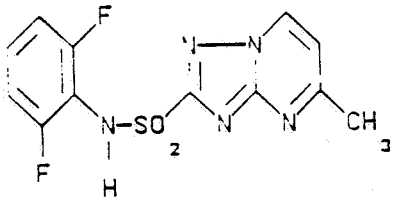
Chemical and Physical Properties

Chemical Classification: Sulfonamide herbicides

Chemical Name: N-(2,6-difluorophenyl)-5-methyl-1,2,4-triazolo[1,5a]pyrimidine-2-sulfonamide

Internal Code: DR-0238-5651
K-170,711

Statement of Formula



Molecular Formula: $C_{12}H_9F_2N_5O_2S$

Molecular Weight: 325.305

CAS Number: 98967-40-9

Color: Light tan powder

Physical state: Powder at 25°C

Odor: Sweet, musty

Melting Point: 253°C

Density: 1.77 g/cc at 21°C

Solubility: Water at 25°C pH 2.5 49.1 mg/l
pH 7.0 5.65 g/l

Vapor Pressure: 0.8×10^{-15} mmHg at 20°C

Dissociation Constant, pKa: 5.5

Octanol/Water, Kow: 1.62

Stability: Stable for at least one year at ambient temperature in glass.

MAMMALIAN TOXICOLOGICAL STUDIES SUMMARY

XRM-5019

Acute oral - rat (♂ and ♀)
- >5000 mg/kg

Acute dermal - rabbit
- >2000 mg/kg

Primary eye irritation - rabbit
- Ocular discharge was noted one hour post-instillation.
- Conjunctivae were observed to be slight to moderate with regard to redness and slight to moderate with regard to chemosis.
- All signs of ocular irritation were resolved by 72 hours post-instillation.

Primary dermal irritation - rabbit
- Slight erythema was observed but this was attributed to injury attributed to mechanical removal of the test formulation.

Dermal sensitization - guinea pig
- Delayed contact hypersensitivity was not observed.

XRD-498

Acute oral - rat (♂ and ♀)
- >5000 mg/kg

Acute dermal - rabbit
- >2000 mg/kg

Primary eye irritation - rabbit
- Slight conjunctival redness, slight conjunctival chemosis and reddening of the iris was observed up to 24 hours post-instillation.
- No signs of ocular irritation were noted at the 48 or 72 hour post-treatment observations.

Primary dermal irritation - rabbit
- No signs of dermal irritation were observed at any time post-treatment.

Dermal sensitization - guinea pig
- Delayed contact hypersensitivity was not observed.

Subchronic (13 week) oral - rat

- No toxicologically significant effects were noted in females at 1000 mg/kg/day and in males at 250 mg/kg/day.
- Renal lesions were observed in males fed 1905 mg/kg (also one animal fed 1000 mg/kg) and females fed 2500 mg/kg.
- Increased cecal weights were noted in high and intermediate dose groups. These increased weights were unassociated with any histopathologic changes and considered a physiologic adaptation of the animals to XRD-498 ingestion.

Teratology - rat

- No-Observed-Effect Level (NOEL) was 1000 mg/kg/day (highest dose tested) for embryo/fetotoxic or teratogenic effects.

Mutagenicity

- Results from the following studies were negative
  - Ames Salmonella/Mammalian Microsomal Assay
  - Rat Hepatocyte Unscheduled DNA Synethesis Assay
  - Chinese Hampster Ovary Cell/Hypoxanthine - Guanine - Phosphoribosyl Transferase Forward Mutation Assay
  - Mouse Bone Marrow Micronucleus Test

RESIDUE AND ENVIRONMENTAL DATA SUMMARY

Hydrolysis

The hydrolysis of XRD-498 was studies at approximately 0.6 ppm, in the dark, at 25°C in sterile, dilutely buffered water at solution pHs of 5, 7, and 9. XRD-498 was stable to hydrolysis under these conditions, exhibiting no loss of the parent compound after 66 days of incubation.

Aerobic Soil Metabolism

XRD-498 aerobic soil degradation was studied at 0.2 ppm in 4 soils incubated at 25°C and 75% 1/3 bar moisture for 0 to 382 days. The soils ranged in texture from sandy loam to clay loam and came from different parts of the U.S.: Illinois, Georgia, Ohio, and Minnesota. The ^{14}C label was in the 5-position of the triazolopyrimidine ring.

Results showed conversion of XRD-498 to CO_2 and material incorporated into soil organic matter. No accumulation of intermediate breakdown products to levels of 0.01 ppm or greater occurred during the degradation process. XRD-498 degraded to 50% of the amount applied originally within 93, 23, 60, and 102 days for soil from Illinois, Georgia, Ohio, and Minnesota, respectively; but subsequent rates were slower for material remaining after the initial loss. Accountability of activity throughout the study was near 100% for all soils.

In a second study, the degradation of XRD-498 was studied in 24 soils from the U.S. soybean market. The first order half-life was strongly related to adsorption Kd in that XRD-498 degraded more quickly in soils which adsorbed it less strongly. Adsorption of XRD-498, in turn, decreased on higher pH soils, but increased with higher organic carbon content. Half-lives were thus influenced by both pH and soil organic carbon: They were 2 to 4 weeks for high pH ($pH \geq 7.0$) soils unless organic carbon was above 2.5%, at which half-lives were 1 to 3 months. For medium pH ($6.4 \leq pH \leq 6.9$) soils half-lives were 1 to 2 months, while for low pH soils ($5.9 \leq pH \leq 6.3$) half-lives were 2 to 4 months. Two soils with lower pH (5.9 and 6.4) also had relatively low half-lives (36 and 23 days), possibly due to their low organic carbon contents (0.7% and 0.6%). These results mean that persistence of XRD-498 in the field should be shorter for soils with higher pH, but longer for soils with higher organic carbon contents.

Soil Adsorption/Desorption

The soil adsorption/desorption properties of 5-^{14}C-pyrimidine ring-labeled XRD-498 were studied in the laboratory on four surface soils (Catlin silt loam, Appling Coarse sandy loam, Hoytville clay, and Webster loam) with varying textures and organic carbon contents. The adsorption study was equilibrated at four initial solution concentrations of approximately 0.1, 0.6, 1.2, and 3.5 ppm, while a desorption study used the same soils with similar quantities of XRD-498, but with a 24 hour incubation time prior to desorption. An additional, aged-soil desorption study consisted of soils incubated with 0.20 ppm of XRD-498 at 25°C and 75% of 1/3 bar moisture for periods of approximately 0, 7, 14, 28 or 34, and 56 or 59 days. The adsorption K_{oc} value averaged 15 mL/g for the four soils tested, while the 24 hour and aged-soil desorption K_{oc}'s averaged 27 and 49 mL/g respectively.

Confined Rotational Accumulation

XRD-498 was applied in acetone solution to two soil plots in the field at a rate of 134 g/ha. Thirty days after application, lettuce, turnips, green beans and wheat were planted in one of the plots. Fifty-two days after application, spinach and carrots were planted between the rows of the lettuce and turnips which were not growing or growing very slowly. The spinach and turnips eventually died. The fifty-two-day planting of carrots was necessary to ensure a root crop harvest for the 30-day phase of the study. The other treated plot lay fallow until late August when approximately the first 23 centimeters of soil was transferred to the greenhouse. One hundred twenty days after application, lettuce, carrots, soybeans and wheat were planted in separate containers of the treated soil moved to the greenhouse. For both the 30-day and 120-day phases of the study, the crops were maintained according to normal practice and were harvested at conventional times.

The magnitude of the ^{14}C-residue level was determined in the dried plant fractions by combustion analysis. The qualitative nature of the ^{14}C residue in the 30-day and 118-day preplant soil samples and in the wheat straw/chaff crop fraction from the 30-day phase of the study was examined. The soil samples and wheat straw/chaff sample were extracted then concentrated and chromatographed. The ^{14}C-residue profile obtained from these analyses is summarized in the table. For reverse phase liquid chromatographic analysis, the ^{14}C residue, Component A, was unretained. Component C in the soil analyses was tentatively identified by co-chromatography as XRD-498. Component B was more polar than XRD-498 under reverse phase chromatographic conditions. The preplant soil samples identified in the table were composites of the first 15 cm of soil. For the 120-day phase of the study, the ^{14}C residues in the 15- to 38-cm region of the soil were determined to be $\leq$0.005 ppm XRD-498 equivalents.